Arizona's Instrument to Measure Standards (AIMS HS)

Mathematics

Released Items

November 15, 2007

As part of Superintendent Tom Horne's ongoing efforts to improve the communication of academic expectations, the Arizona Department of Education is releasing High School reading, writing, and mathematics items to the public. This release is intended to provide students, parents, teachers, and the community with specific examples of the types of skills being assessed on the AIMS tests. The release is divided into a writing/reading form and a mathematics form, similar to the AIMS test.

Included in this release is a previous prompt and directions used in the AIMS assessments. Following the writing prompt are two reading passages, directions, and the items associated with each passage in the form of a mini-test. These passages and items are from the 2002, 2005, and 2007 AIMS administrations. The final section will contain the individual items with the correct answers and statistical information about each item.

The mathematics section consists of a mini-test with thirty items from the 2002 through 2007 AIMS administrations, followed by the individual items and their statistics.

The statistical information provided includes:

1) item identification number;
2) correct answer;
3) response probability (P-Value), which represents the percentage of students who answered the question correctly;
4) Rasch difficulty, which measures the difficulty of the item on a scale in which -3 indicates a very easy item and +3 indicates an extremely difficult item; and
5) performance objective as the item aligns to the 2003 standards.

The items are reproductions of the actual items as they appeared on the AIMS tests. If you have any questions, please contact Frank Brashear, Director of Test & Item Development, at (602) 542-5031.

MATHEMATICS

Mathematics

DIRECTIONS: Read each question and choose the best answer.

1. If a figure is rotated, which of the following characteristics of the figure is preserved?

I. angle measures
II. perimeter
III. area

A I and II
B II and III
C I and III
D I, II, and III

2. What is the value of the expression below?

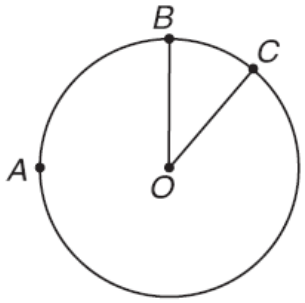
$$|-2| - |4| + |3 - 10|$$

A -9
B -1
C 5
D 13

3. Which of the following is an infinite set?

A integers between -5 and 10
B whole numbers between -5 and 10
C natural numbers between -5 and 10
D rational numbers between -5 and 10

4. Points A, B, and C lie on circle O, as shown below.



What is the measure of $\angle BOC$ if the measure of arc BAC is 320°?

A 40°

B 80°

C 160°

D 320°

5. Which is the solution to the inequality $2x - 3 \geq -4x + 2$?

A $x \geq \frac{1}{2}$

B $x \leq \frac{1}{2}$

C $x \geq \frac{5}{6}$

D $x \leq \frac{5}{6}$

6. In order to plan her budget, Jazmin created a chart of her expenses for three months. After paying her bills and setting aside her savings, she spends what is left for entertainment and miscellaneous expenses.

MONTHLY BUDGET

Wages	Month	Car Payment	Gasoline	Car Insurance	Savings	Entertainment and Miscellaneous
$489	May	213	56	67	75	78
$511	June	213	64	67	75	92
$504	July	213	49	67	75	100

Which of the following is true?

A Jazmin's wages vary monthly.

B Jazmin has $100 each month to spend for entertainment.

C Jazmin's gas expenses have been consistently decreasing.

D Jazmin's car payment is over 50% of her wages.

7. Lee wants to make a sandwich. He has 5 types of meat, 3 types of cheese, and 2 types of sandwich spreads. If Lee chooses 1 meat, 1 cheese, and 1 sandwich spread, how many different combinations are possible for his sandwich?

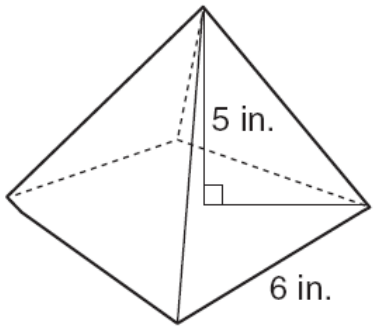
A 10

B 13

C 30

D 33

8. The right square pyramid represented below has a base edge of 6 inches and a height of 5 inches.



What is the volume in cubic inches of the pyramid?

A 60

B 90

C 120

D 180

9. Sean is selecting an outfit from among 2 pairs of pants, 4 shirts, and 3 pairs of shoes. How many different outfits consisting of 1 pair of pants, 1 shirt, and 1 pair of shoes are possible?

A 9

B 12

C 24

D 36

10. Which set contains an irrational number?

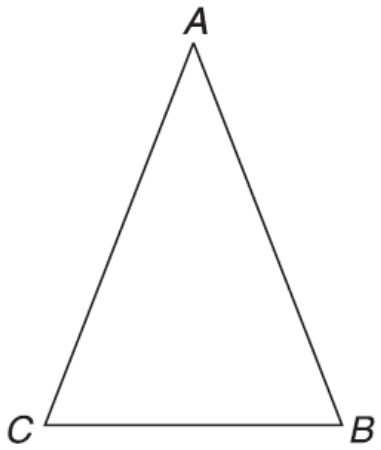
A $\left\{2300, 0.48, \frac{13}{1}\right\}$

B $\left\{18, 0.1, \frac{12}{5}\right\}$

C $\left\{\frac{3}{8}, 4, \sqrt{52}\right\}$

D $\left\{0.333..., \sqrt{4}, 10\right\}$

11. Figure ABC is an isosceles triangle with base $\overline{BC}$.



Which is a true statement about $\triangle ABC$?

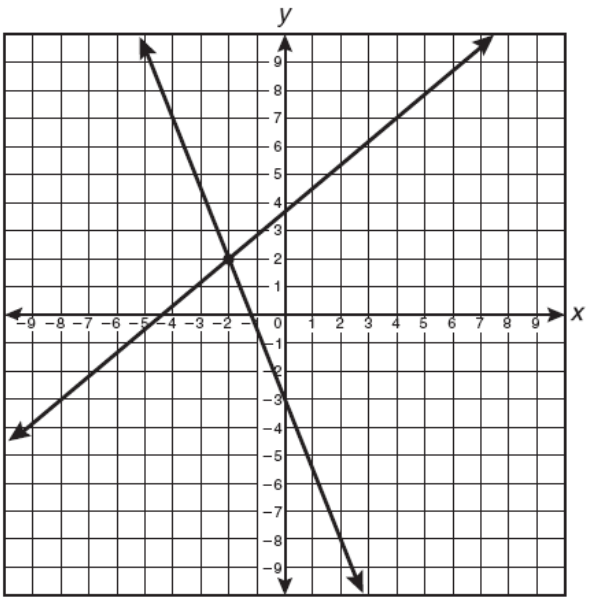
A $\angle A \cong \angle B$

B $\overline{AC} \cong \overline{AB}$

C $\overline{AC} \cong \overline{CB}$

D $\angle C \cong \angle A$

12. What is the apparent solution to the system of equations graphed below?



A $(-2, -2)$

B $(-2, 2)$

C $(2, -2)$

D no solution

13. Joe has $20.00. A six-pack of soda costs $1.89, including tax. What is the greatest number of six-packs of soda he can buy?

A 5

B 10

C 15

D 20

14. Determine the slope m, x-intercept, and y-intercept of the equation $5x - 2y = 10$.

A slope $m = \frac{5}{2}$
x-intercept = (2, 0)
y-intercept = (0, −5)

B slope $m = -\frac{5}{2}$
x-intercept = (2, 0)
y-intercept = (0, −5)

C slope $m = \frac{2}{5}$
x-intercept = (−5, 0)
y-intercept = (0, 2)

D slope $m = -\frac{2}{5}$
x-intercept = (−5, 0)
y-intercept = (0, 2)

15. What is the y-intercept of the graph of the equation $3x + 6y = 18$?

A −6

B −3

C 3

D 6

16. A pattern is described below.

- The first term is 2.
- The second term is 7.
- Each term after the second is found by adding 5 to the immediately preceding term.

What is the fifth term in this pattern?

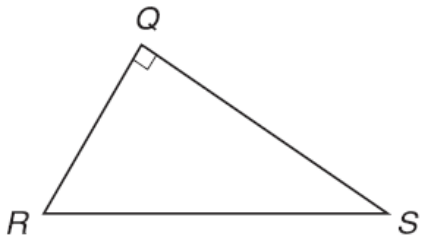
A 5

B 12

C 17

D 22

17. Which of the following must be true for $\triangle QRS$?



A $QR + RS = QS$

B $QR + QS < RS$

C $QS + RS > QR$

D $QR - RS = QS$

18. The math club sold candy bars as a fundraiser. The number of candy bars sold by each member is shown below.

65 76 100 67 44 94 71
69 88 80 63 75 82 62

Which frequency chart accurately represents the data?

# of Candy Bars Sold	Frequency
40–49	1
50–59	1
60–69	3
70–79	3
80–89	5
90–99	0
100–109	1

A

# of Candy Bars Sold	Frequency
40–49	0
50–59	1
60–69	5
70–79	4
80–89	3
90–99	1
100–109	1

C

# of Candy Bars Sold	Frequency
40–49	2
50–59	0
60–69	5
70–79	3
80–89	2
90–99	1
100–109	1

B

# of Candy Bars Sold	Frequency
40–49	1
50–59	0
60–69	5
70–79	3
80–89	3
90–99	1
100–109	1

D

19. If $x = 4$ and $y = -1$, what is the value of the expression below?

$$\sqrt{2x - 8y}$$

A 0

B $\sqrt{5}$

C $\sqrt{14}$

D 4

20. Which of the following is an example of independent events?

A flipping a fair coin and rolling a six-sided number cube

B selecting the order in which one picture will be taken of each of four friends by drawing their names out of a hat

C selecting the order in which each member of a history class will present a speech to the rest of the class

D selecting two different-flavored pieces of candy, one piece at a time, from a bag containing four different flavors of candy

21. Which of the following equations represents the line that passes through the points $(2, -6)$ and $(-4, 3)$?

A $y = -\frac{3}{2}x - 7$

B $y = -\frac{2}{3}x - 3$

C $y = -\frac{3}{2}x - 3$

D $y = -\frac{2}{3}x + \frac{1}{3}$

22. The class wants to order pizza for a study session. There are 3 different vegetable toppings, 3 different meat toppings, and 2 types of crust available. How many different pizzas are possible with 1 vegetable topping, 1 meat topping, and 1 type of crust?

A 6

B 8

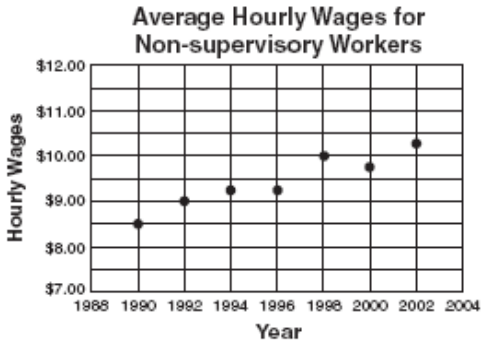
C 12

D 18

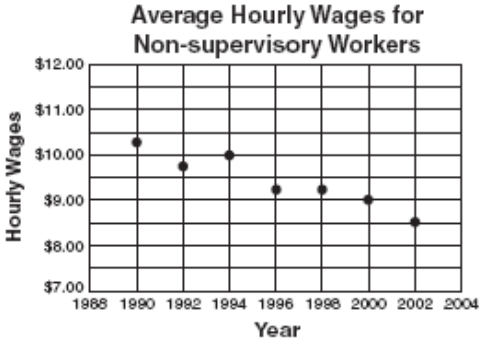
23. The table below shows the average hourly wages for non-supervisory workers for the years 1990–2002. Which scatter plot most accurately shows this information?

Average Hourly Wages for Non-supervisory Workers

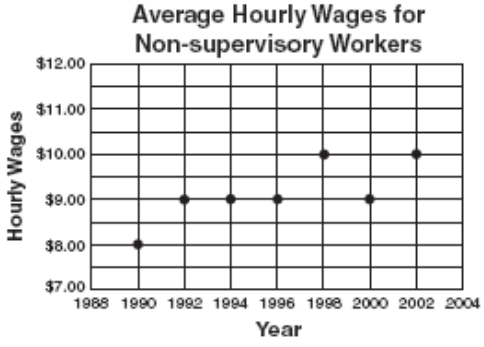
Year	1990	1992	1994	1996	1998	2000	2002
Average Hourly Wage	$8.50	$9.00	$9.25	$9.25	$10.00	$9.75	$10.25



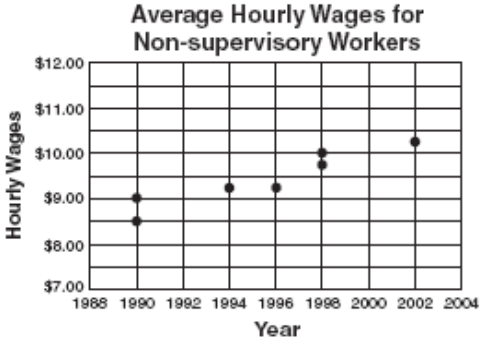
A



C



B



D

24. For what value of x is the proportion below true?

$$\frac{x}{x-2} = \frac{3}{4}$$

A -6

B -2

C 2

D 8

25. Maria took a taxicab from her home to the theater downtown. The taxicab company charges a flat fee of $5.00 plus $0.25 per mile. Which equation represents C, the total cost of her ride, in terms of m, the length of the trip in miles?

A $C = 0.25m$

B $C = 5.25m$

C $C = 5 + 0.25m$

D $C = 5m + 0.25$

26. What is the solution to the equation below?

$$3(x - 4) = 5x - 6$$

A $x = -3$

B $x = \frac{3}{4}$

C $x = 1$

D $x = 9$

27. The sequence below is defined by starting with 1, then adding 2 to the immediately preceding term. What is the 10th term of the sequence if the pattern continues?

1, 3, 5, 7, 9, . . .

A 9

B 11

C 19

D 21

28. What is the solution to the equation below?

$$\frac{x}{4} = \frac{x+1}{3}$$

A $x = -4$

B $x = -1$

C $x = \frac{1}{7}$

D $x = \frac{4}{7}$

29. Which property of real numbers is illustrated below?

$$x(y + z) = xy + xz$$

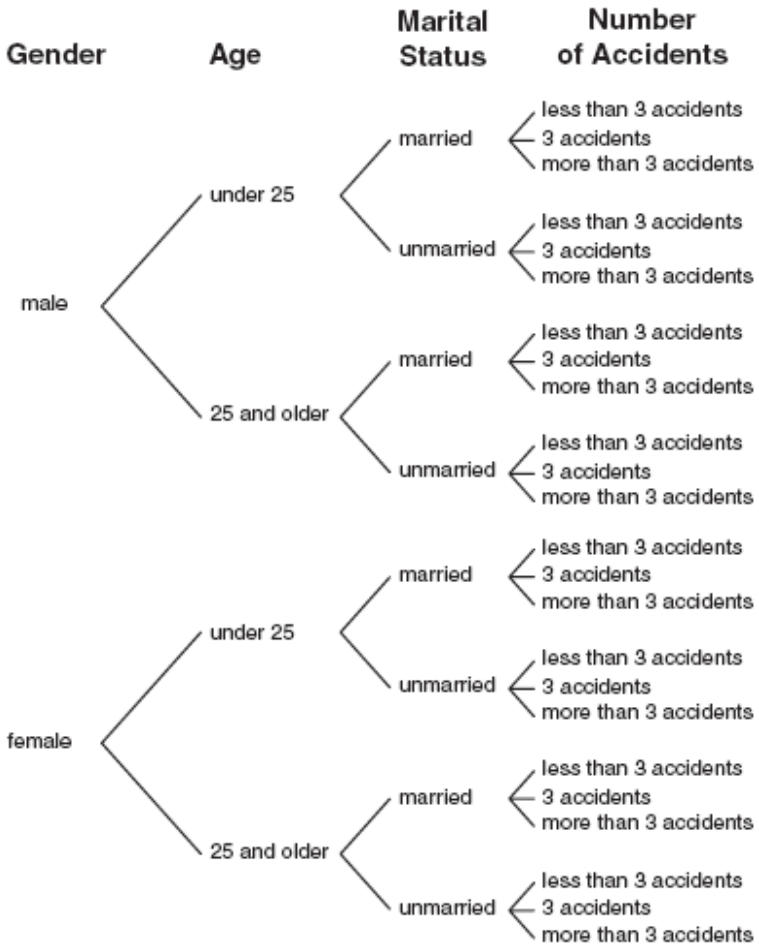
A Associative Property of Addition

B Associative Property of Multiplication

C Distributive Property

D Commutative Property of Multiplication

30. An insurance actuary used the tree diagram below to help categorize drivers by gender, age, marital status, and accident history. Based on the diagram, how many combinations of gender, age, marital status, and number of accidents are possible?



A 24

B 8

C 6

D 3

1

Item Number	3015124	Correct Answer	D	P-Value	.711	Equated Rasch Value	-0.2511
2003 Mathematics Standard Alignment is Strand **4** – Concept **2** – Performance Objective **6**							

If a figure is rotated, which of the following characteristics of the figure is preserved?

I. angle measures
II. perimeter
III. area

A I and II
B II and III
C I and III
D I, II, and III

2

Item Number	3140727	Correct Answer	C	P-Value	.53	Equated Rasch Value	0.5381
2003 Mathematics Standard Alignment is Strand **1** – Concept **2** – Performance Objective **3**							

What is the value of the expression below?

$$\left|-2\right| - \left|4\right| + \left|3 - 10\right|$$

A -9
B -1
C 5
D 13

3

Item Number	3261711	Correct Answer	D	P-Value	.35	Equated Rasch Value	2.0274
2003 Mathematics Standard Alignment is Strand **1** – Concept **1** – Performance Objective **3**							

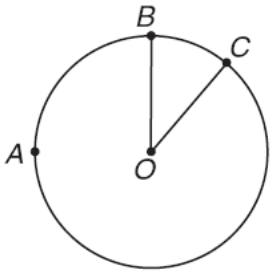
Which of the following is an infinite set?

A integers between -5 and 10
B whole numbers between -5 and 10
C natural numbers between -5 and 10
D rational numbers between -5 and 10

4

Item Number	3261727	Correct Answer	A	P-Value	.75	Equated Rasch Value	-0.2241
2003 Mathematics Standard Alignment is Strand **4** – Concept **1** – Performance Objective **7**							

Points A, B, and C lie on circle O, as shown below.



What is the measure of $\angle BOC$ if the measure of arc BAC is 320°?

A 40°

B 80°

C 160°

D 320°

5

Item Number	3267505	Correct Answer	C	P-Value	.58	Equated Rasch Value	0.7371
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **9**							

Which is the solution to the inequality $2x - 3 \geq -4x + 2$?

A $x \geq \frac{1}{2}$

B $x \leq \frac{1}{2}$

C $x \geq \frac{5}{6}$

D $x \leq \frac{5}{6}$

6

Item Number	3140848	Correct Answer	A	P-Value	.72	Equated Rasch Value	-0.4598
2003 Mathematics Standard Alignment is Strand **2** – Concept **1** – Performance Objective **9**							

In order to plan her budget, Jazmin created a chart of her expenses for three months. After paying her bills and setting aside her savings, she spends what is left for entertainment and miscellaneous expenses.

MONTHLY BUDGET

Wages	Month	Car Payment	Gasoline	Car Insurance	Savings	Entertainment and Miscellaneous
$489	May	213	56	67	75	78
$511	June	213	64	67	75	92
$504	July	213	49	67	75	100

Which of the following is true?

A Jazmin's wages vary monthly.

B Jazmin has $100 each month to spend for entertainment.

C Jazmin's gas expenses have been consistently decreasing.

D Jazmin's car payment is over 50% of her wages.

7

Item Number	3261154	Correct Answer	C	P-Value	.79	Equated Rasch Value	-0.2085
2003 Mathematics Standard Alignment is Strand **2** – Concept **3** – Performance Objective **1**							

Lee wants to make a sandwich. He has 5 types of meat, 3 types of cheese, and 2 types of sandwich spreads. If Lee chooses 1 meat, 1 cheese, and 1 sandwich spread, how many different combinations are possible for his sandwich?

A 10

B 13

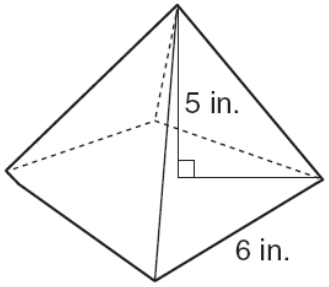
C 30

D 33

8

Item Number	3140888	Correct Answer	A	P-Value	.48	Equated Rasch Value	0.6234
2003 Mathematics Standard Alignment is Strand **4** – Concept **4** – Performance Objective **2**							

The right square pyramid represented below has a base edge of 6 inches and a height of 5 inches.



What is the volume in cubic inches of the pyramid?

A 60

B 90

C 120

D 180

9

Item Number	3261155	Correct Answer	C	P-Value	.7286	Equated Rasch Value	-0.1366
2003 Mathematics Standard Alignment is Strand **2** – Concept **3** – Performance Objective **1**							

Sean is selecting an outfit from among 2 pairs of pants, 4 shirts, and 3 pairs of shoes. How many different outfits consisting of 1 pair of pants, 1 shirt, and 1 pair of shoes are possible?

A 9

B 12

C 24

D 36

10

Item Number	3261159	Correct Answer	C	P-Value	.32	Equated Rasch Value	1.9703
2003 Mathematics Standard Alignment is Strand **1** – Concept **1** – Performance Objective **1**							

Which set contains an irrational number?

A $\left\{2300, 0.48, \frac{13}{1}\right\}$

B $\left\{18, 0.1, \frac{12}{5}\right\}$

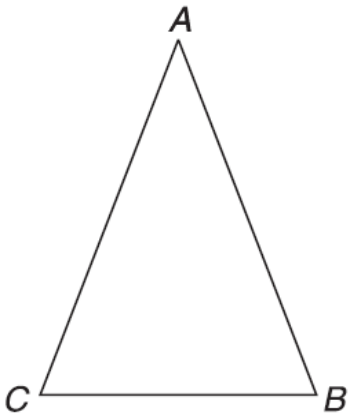
C $\left\{\frac{3}{8}, 4, \sqrt{52}\right\}$

D $\left\{0.333..., \sqrt{4}, 10\right\}$

11

Item Number	3015223	Correct Answer	B	P-Value	.86	Equated Rasch Value	-0.9012
2003 Mathematics Standard Alignment is Strand **4** – Concept **1** – Performance Objective **1**							

Figure ABC is an isosceles triangle with base $\overline{BC}$.



Which is a true statement about $\triangle ABC$?

A $\angle A \cong \angle B$

B $\overline{AC} \cong \overline{AB}$

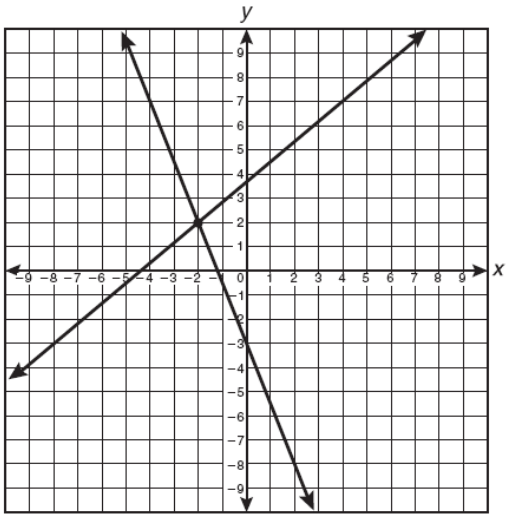
C $\overline{AC} \cong \overline{CB}$

D $\angle C \cong \angle A$

12

Item Number	3140700	Correct Answer	B	P-Value	.75	Equated Rasch Value	-0.2004
2003 Mathematics Standard Alignment is Strand **4** – Concept **3** – Performance Objective **4**							

What is the apparent solution to the system of equations graphed below?



A $(-2, -2)$

B $(-2, 2)$

C $(2, -2)$

D no solution

13

Item Number	3140642	Correct Answer	B	P-Value	.82	Equated Rasch Value	-1.1396
2003 Mathematics Standard Alignment is Strand **1** – Concept **2** – Performance Objective **2**							

Joe has $20.00. A six-pack of soda costs $1.89, including tax. What is the greatest number of six-packs of soda he can buy?

A 5

B 10

C 15

D 20

14

Item Number	2019624	Correct Answer	A	P-Value	.411	Equated Rasch Value	1.3714
2003 Mathematics Standard Alignment is Strand **3** – Concept **4** – Performance Objective **1**							

Determine the slope m, x-intercept, and y-intercept of the equation $5x - 2y = 10$.

A slope $m = \frac{5}{2}$
x-intercept = (2, 0)
y-intercept = (0, −5)

B slope $m = -\frac{5}{2}$
x-intercept = (2, 0)
y-intercept = (0, −5)

C slope $m = \frac{2}{5}$
x-intercept = (−5, 0)
y-intercept = (0, 2)

D slope $m = -\frac{2}{5}$
x-intercept = (−5, 0)
y-intercept = (0, 2)

15

Item Number	3015151	Correct Answer	C	P-Value	.60	Equated Rasch Value	0.5652
2003 Mathematics Standard Alignment is Strand **3** – Concept **4** – Performance Objective **1**							

What is the y-intercept of the graph of the equation $3x + 6y = 18$?

A −6

B −3

C 3

D 6

16

Item Number	3267518	Correct Answer	D	P-Value	.83	Equated Rasch Value	-0.954
2003 Mathematics Standard Alignment is Strand **3** – Concept **1** – Performance Objective **2**							

A pattern is described below.

- The first term is 2.
- The second term is 7.
- Each term after the second is found by adding 5 to the immediately preceding term.

What is the fifth term in this pattern?

A 5

B 12

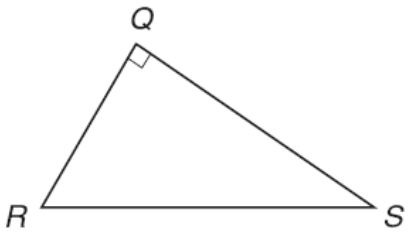
C 17

D 22

17

Item Number	3140881	Correct Answer	C	P-Value	.61	Equated Rasch Value	0.3271
2003 Mathematics Standard Alignment is Strand **4** – Concept **1** – Performance Objective **9**							

Which of the following must be true for $\triangle QRS$?



A $QR + RS = QS$

B $QR + QS < RS$

C $QS + RS > QR$

D $QR - RS = QS$

18

Item Number	2019589	Correct Answer	D	P-Value	.86	Equated Rasch Value	-1.3102
2003 Mathematics Standard Alignment is Strand **2** – Concept **1** – Performance Objective **3**							

The math club sold candy bars as a fundraiser. The number of candy bars sold by each member is shown below.

65 76 100 67 44 94 71
69 88 80 63 75 82 62

Which frequency chart accurately represents the data?

# of Candy Bars Sold	Frequency
40–49	1
50–59	1
60–69	3
70–79	3
80–89	5
90–99	0
100–109	1

A

# of Candy Bars Sold	Frequency
40–49	0
50–59	1
60–69	5
70–79	4
80–89	3
90–99	1
100–109	1

C

# of Candy Bars Sold	Frequency
40–49	2
50–59	0
60–69	5
70–79	3
80–89	2
90–99	1
100–109	1

B

# of Candy Bars Sold	Frequency
40–49	1
50–59	0
60–69	5
70–79	3
80–89	3
90–99	1
100–109	1

D

19

Item Number	3267460	Correct Answer	D	P-Value	.59	Equated Rasch Value	0.5332
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **1**							

If $x = 4$ and $y = -1$, what is the value of the expression below?

$$\sqrt{2x - 8y}$$

A 0

B $\sqrt{5}$

C $\sqrt{14}$

D 4

20

Item Number	3140790	Correct Answer	A	P-Value	.53	Equated Rasch Value	1.1114
2003 Mathematics Standard Alignment is Strand **2** – Concept **2** – Performance Objective **6**							

Which of the following is an example of independent events?

A flipping a fair coin and rolling a six-sided number cube

B selecting the order in which one picture will be taken of each of four friends by drawing their names out of a hat

C selecting the order in which each member of a history class will present a speech to the rest of the class

D selecting two different-flavored pieces of candy, one piece at a time, from a bag containing four different flavors of candy

21

Item Number	2019600	Correct Answer	C	P-Value	.52	Equated Rasch Value	0.9039
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **10**							

Which of the following equations represents the line that passes through the points $(2, -6)$ and $(-4, 3)$?

A $y = -\frac{3}{2}x - 7$

B $y = -\frac{2}{3}x - 3$

C $y = -\frac{3}{2}x - 3$

D $y = -\frac{2}{3}x + \frac{1}{3}$

22

Item Number	3140793	Correct Answer	D	P-Value	.5789	Equated Rasch Value	0.4578
2003 Mathematics Standard Alignment is Strand **2** – Concept **3** – Performance Objective **1**							

The class wants to order pizza for a study session. There are 3 different vegetable toppings, 3 different meat toppings, and 2 types of crust available. How many different pizzas are possible with 1 vegetable topping, 1 meat topping, and 1 type of crust?

A 6

B 8

C 12

D 18

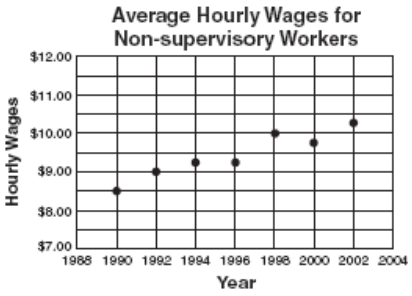
23

Item Number	3140845	Correct Answer	A	P-Value	.878	Equated Rasch Value	-1.8014
2003 Mathematics Standard Alignment is Strand **2** – Concept **1** – Performance Objective **3**							

The table below shows the average hourly wages for non-supervisory workers for the years 1990–2002. Which scatter plot most accurately shows this information?

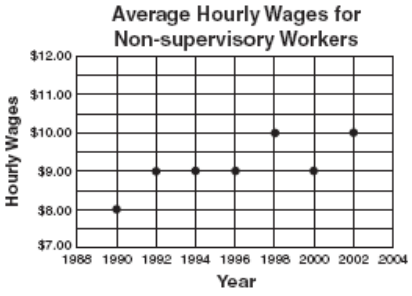
Average Hourly Wages for Non-supervisory Workers

Year	1990	1992	1994	1996	1998	2000	2002
Average Hourly Wage	$8.50	$9.00	$9.25	$9.25	$10.00	$9.75	$10.25

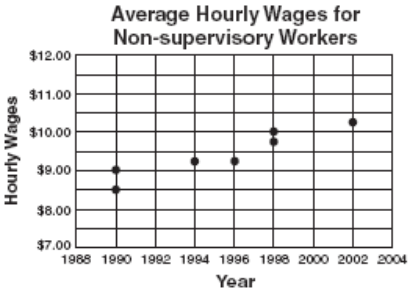


A

C



B



D

24

Item Number	3140755	Correct Answer	A	P-Value	.6517	Equated Rasch Value	-0.0049
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **11**							

For what value of x is the proportion below true?

$$\frac{x}{x-2} = \frac{3}{4}$$

A -6

B -2

C 2

D 8

25

Item Number	3140752	Correct Answer	C	P-Value	.8149	Equated Rasch Value	-1.0988
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **5**							

Maria took a taxicab from her home to the theater downtown. The taxicab company charges a flat fee of $5.00 plus $0.25 per mile. Which equation represents C, the total cost of her ride, in terms of m, the length of the trip in miles?

A $C = 0.25m$

B $C = 5.25m$

C $C = 5 + 0.25m$

D $C = 5m + 0.25$

26

Item Number	3140753	Correct Answer	A	P-Value	.71	Equated Rasch Value	-0.0215
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **8**							

What is the solution to the equation below?

$$3(x - 4) = 5x - 6$$

A $x = -3$

B $x = \frac{3}{4}$

C $x = 1$

D $x = 9$

27

Item Number	3140797	Correct Answer	C	P-Value	.7526	Equated Rasch Value	-0.5855
2003 Mathematics Standard Alignment is Strand **3** – Concept **1** – Performance Objective **2**							

The sequence below is defined by starting with 1, then adding 2 to the immediately preceding term. What is the 10th term of the sequence if the pattern continues?

1, 3, 5, 7, 9, . . .

A 9

B 11

C 19

D 21

28

Item Number	3267472	Correct Answer	A	P-Value	.55	Equated Rasch Value	0.8311
2003 Mathematics Standard Alignment is Strand **3** – Concept **3** – Performance Objective **11**							

What is the solution to the equation below?

$$\frac{x}{4} = \frac{x+1}{3}$$

A $x = -4$

B $x = -1$

C $x = \frac{1}{7}$

D $x = \frac{4}{7}$

29

Item Number	3140838	Correct Answer	C	P-Value	.6001	Equated Rasch Value	0.3516
2003 Mathematics Standard Alignment is Strand **1** – Concept **1** – Performance Objective **2**							

Which property of real numbers is illustrated below?

$$x(y + z) = xy + xz$$

A Associative Property of Addition

B Associative Property of Multiplication

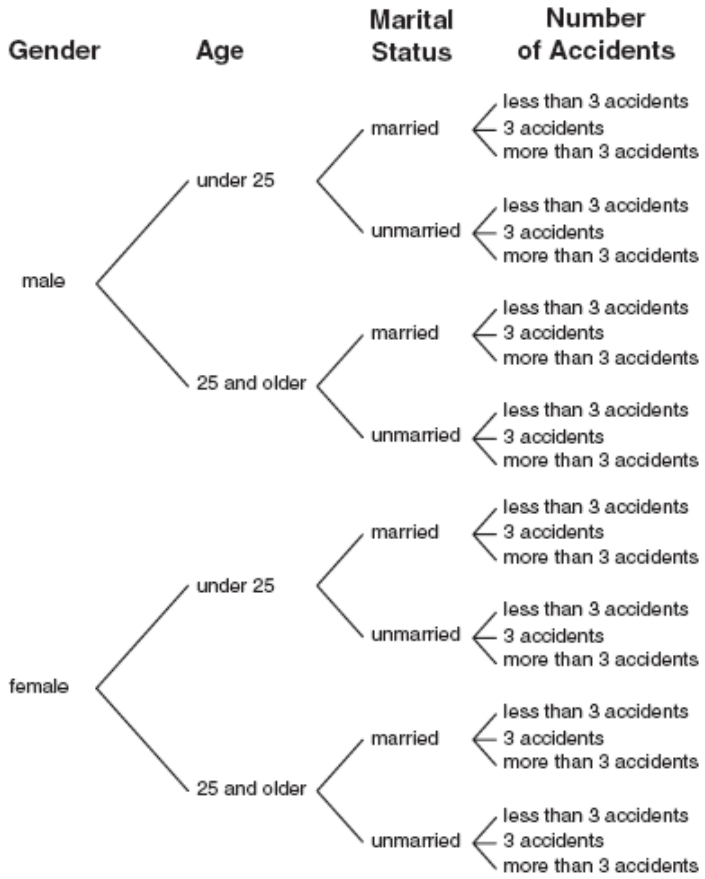
C Distributive Property

D Commutative Property of Multiplication

30

Item Number	3015208	Correct Answer	A	P-Value	.76	Equated Rasch Value	-0.1757
2003 Mathematics Standard Alignment is Strand **2** – Concept **3** – Performance Objective **1**							

An insurance actuary used the tree diagram below to help categorize drivers by gender, age, marital status, and accident history. Based on the diagram, how many combinations of gender, age, marital status, and number of accidents are possible?



A 24

B 8

C 6

D 3