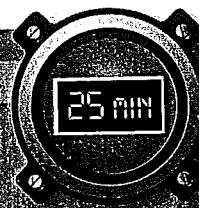




CALCULATOR ALLOWED

Advanced level questions



Mini Test 26: Algebra—Substitution and Equations

1 What is the value of $3x - x^2$ when $x = -4$?
A 4 B -5 C -18 D -28

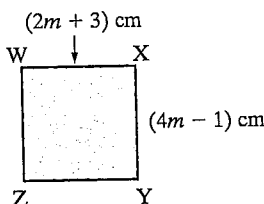
2 If $a = 3$ and $b = -2$, what is the value of $2ab^2$?
A -24 B -72 C 24 D 72

3 The volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$ where r is the radius of the sphere. When the radius is 8 metres, the volume of the sphere is closest to
A 37 630 m³ B 21 167 m³
C 67 m³ D 2145 m³

4 $5(2m - 3) = 8m + 7$
The value of m in this equation is $m = \boxed{}$

5 A rule for y in terms of x is $y = 4 - 5x$. When $x = 1.2$, what is the value of y ?
A -2 B -2.2 C -1.2 D -0.2

6 WXYZ is a square.
What is the length of each side of the square?
 $\boxed{}$ cm



7 If $t = 6$, what is the value of $2t^2 - 3t$?
A 36 B 54 C 90 D 126

8 The profit, $\$P$, that Kylie makes when she sells n dolls is given by the rule $P = 8n - 160$. If Kylie makes a profit of $\$280$, how many dolls did she sell? $\boxed{}$

9 A person of weight m kilograms and height h metres is judged to be overweight if $\frac{m}{h^2} > 25$. A person with which of these measurements would be overweight?

- A weight 55 kg, height 1.5 m
- B weight 60 kg, height 1.6 m
- C weight 75 kg, height 1.7 m
- D weight 80 kg, height 1.8 m

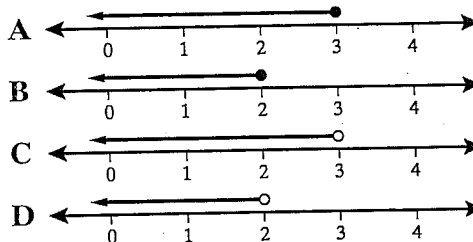
10 If $a = -1$, what is the value of $3 - 2a - a^2$?
A -1 B 4 C 6 D 1

11 If $c^2 = a^2 + b^2$ and $a = 8$ and $b = 15$, which could be the value of c ?
A 17 B 23 C 79 D 289

12 $7x + 8 = 5x - 4$
What is the value of x in the equation? $x = \boxed{}$

13 The cost, $\$C$, per person for a trip is given by $C = \frac{360}{n}$, where n is the number of people taking the trip. If $C = 9$, what is the value of n ? $n = \boxed{}$

14 Which number line shows the solution of $2x - 1 < 5$?



15 If $y = 5x^2$, what is the value of y when $x = 1.5$? $\boxed{}$

16 Which value of x will **not** make the inequality $11 - 3x \geq 2$ true?
A $x = -2$ B $x = 0$
C $x = 3$ D $x = 6$

17 Young's rule is a formula that determines the correct dose of medicine for a child when the adult dose of that medicine and the age of the child are known.

The rule is $C = \frac{nA}{n + 12}$ where C is the child's dose in millilitres, n is the child's age in years and A is the adult dose in millilitres.

What is the correct dose for a four-year-old child when the adult dose is 20 mL?

- A 5 mL B 10 mL C 12 mL D 15 mL

18 It is known that $\frac{3}{8} > \frac{5}{x}$. If x is a positive whole number, what is its smallest possible value? $\boxed{}$

1 D 2 C 3 D 4 $m = 11$ 5 A 6 7 cm 7 B
 8 55 9 C 10 B 11 A 12 $x = -6$ 13 $n = 40$
 14 C 15 11.25 16 D 17 A 18 14

1 When $x = -4$,
 $3x - x^2 = 3 \times -4 - (-4)^2$
 $= -12 - 16$
 $= -28$

2 If $a = 3$ and $b = -2$,
 $2ab^2 = 2 \times 3 \times (-2)^2$
 $= 2 \times 3 \times 4$
 $= 24$

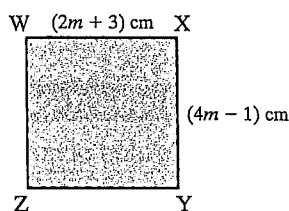
3 $V = \frac{4}{3}\pi r^3$
 When $r = 8$,
 $V = \frac{4}{3} \times \pi \times 8^3$
 $= 2144.6605\dots$
 $= 2145$ (nearest whole number)

The volume is closest to 2145 m^3 .

4 $5(2m - 3) = 8m + 7$
 [Remove the grouping symbols.]
 $10m - 15 = 8m + 7$
 [Add 15 to both sides.]
 $10m = 8m + 22$
 [Subtract $8m$ from both sides.]
 $2m = 22$
 [Divide both sides by 2.]
 $m = 11$

5 $y = 4 - 5x$
 When $x = 1.2$,
 $y = 4 - 5 \times 1.2$
 $= 4 - 6$
 $= -2$

6 The sides of a square are equal in length.



So $4m - 1 = 2m + 3$
 [Add 1 to both sides.]
 $4m = 2m + 4$
 [Subtract $2m$ from both sides.]
 $2m = 4$
 [Divide both sides by 2.]
 $m = 2$

If $m = 2$,
 $4m - 1 = 4 \times 2 - 1$
 $= 8 - 1$
 $= 7$
 [And $2m + 3 = 2 \times 2 + 3 = 4 + 3 = 7$]
 The length of each side is 7 cm.

7 If $t = 6$,
 $2t^2 - 3t = 2 \times 6^2 - 3 \times 6$
 $= 2 \times 36 - 18$
 $= 72 - 18$
 $= 54$

8 $P = 8n - 160$
 When $P = 280$,
 $280 = 8n - 160$
 [Add 160 to both sides.]
 $440 = 8n$
 [Divide both sides by 8.]
 $55 = n$
 Kylie would need to sell 55 dolls to make a profit of \$280.

9 $\frac{m}{h^2} > 25$

Try each option:

When $m = 55$ and $h = 1.5$,
 $\frac{m}{h^2} = \frac{55}{(1.5)^2}$
 $= 24.44444\dots (< 25)$

When $m = 60$ and $h = 1.6$,
 $\frac{m}{h^2} = \frac{60}{(1.6)^2}$
 $= 23.4375 (< 25)$

When $m = 75$ and $h = 1.7$,
 $\frac{m}{h^2} = \frac{75}{(1.7)^2}$
 $= 25.951557\dots (> 25)$

When $m = 80$ and $h = 1.8$,
 $\frac{m}{h^2} = \frac{80}{(1.8)^2}$
 $= 24.691358\dots (< 25)$

So, a person with weight 75 kg and height 1.7 m would be overweight.

10 If $a = -1$,
 $3 - 2a - a^2 = 3 - 2 \times -1 - (-1)^2$
 $= 3 + 2 - 1$
 $= 4$

11 $c^2 = a^2 + b^2$
 If $a = 8$ and $b = 15$,
 $c^2 = 8^2 + 15^2$
 $= 64 + 225$
 $= 289$
 $c = \sqrt{289} (c > 0)$
 $= 17$

[$c = -17$ would also be a valid answer, but it is not one of the options. (This formula is Pythagoras' theorem and is used to find the lengths of the sides of right-angled triangles which cannot be negative.)]

12 $7x + 8 = 5x - 4$
 [Subtract 8 from both sides.]
 $7x = 5x - 12$
 [Subtract $5x$ from both sides.]
 $2x = -12$
 [Divide both sides by 2.]
 $x = -6$

$$13 \quad C = \frac{360}{n}$$

If $C = 9$,

$$9 = \frac{360}{n}$$

[Multiply both sides by n .]

$$9n = 360$$

[Divide both sides by 9.]

$$n = 40$$

$$18 \quad \frac{3}{8} > \frac{5}{x}$$

[Multiply both sides by $8x$.]

$$3x > 40$$

[Divide both sides by 3.]

$$x > 13.3333\dots$$

So the smallest possible value of x is 14.

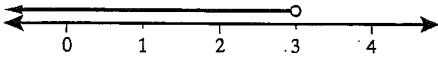
$$14 \quad 2x - 1 < 5$$

[Add 1 to both sides.]

$$2x < 6$$

[Divide both sides by 2.]

$$x < 3$$



$$15 \quad y = 5x^2$$

When $x = 1.5$,

$$y = 5 \times (1.5)^2$$

$$= 5 \times 2.25$$

$$= 11.25$$

$$16 \quad 11 - 3x \geq 2$$

Try each option:

If $x = -2$,

$$11 - 3x = 11 - 3 \times -2$$

$$= 11 + 6$$

$$= 17 (> 2)$$

This option does make the inequality true.

If $x = 0$,

$$11 - 3x = 11 - 3 \times 0$$

$$= 11 - 0$$

$$= 11 (> 2)$$

This option does make the inequality true.

If $x = 3$,

$$11 - 3x = 11 - 3 \times 3$$

$$= 11 - 9$$

$$= 2 (= 2)$$

This option does make the inequality true.

If $x = 6$,

$$11 - 3x = 11 - 3 \times 6$$

$$= 11 - 18$$

$$= -7 (< 2)$$

This option does not make the inequality true.

The value of x that does not make the inequality true is $x = 6$.

$$17 \quad C = \frac{nA}{n + 12}$$

When $n = 4$ and $A = 20$,

$$C = \frac{4 \times 20}{4 + 12}$$

$$= \frac{80}{16}$$

$$= 5$$

The correct dose for a four-year-old child is 5 mL.