## EXAM 3\_1 (Geometry - Powers)

1. Reduce the powers, using properties:

(1.5 points)

$$a)\left(\frac{2}{3}\right)^{-3}\cdot\frac{2}{9}\cdot\left(-\frac{2}{3}\right)^2=$$

b) 
$$\frac{a^{-3} \cdot (ab^2)^3 \cdot (a^2)^4}{a^4 \cdot b^{-4} \cdot (ab)^3} =$$

2. Calculate, giving the answer in standard form with 3 s.f.

(1.5 points)

a) 
$$(1.86 \cdot 10^{-7}) \div (6.5 \cdot 10^{-12}) =$$

b) 
$$8.63 \cdot 10^{11} - 4.21 \cdot 10^{10} =$$

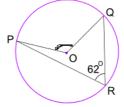
3. Find the measures of the unknown angles.

(1.5 points)

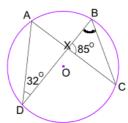




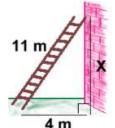




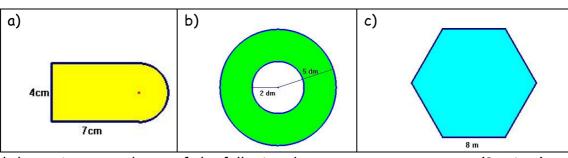
b) 
$$\hat{CBX} =$$



4. How far up a wall will an 11m ladder reach, if the foot of the ladder must be 4m from the base of the wall? (1 point)

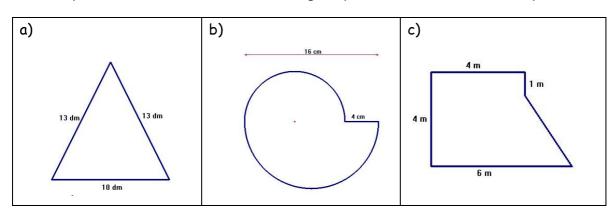


- 5. Find the area of the shaded regions:
- (1.5 points)



6. Find the perimeter and area of the following  $\overline{shapes}$ :

(3 points)





## SOLUTION

1. Reduce the powers, using properties:

$$a) \left(\frac{2}{3}\right)^{-3} \cdot \frac{2}{9} \cdot \left(-\frac{2}{3}\right)^2 = \frac{3^3}{2^3} \cdot \frac{2}{3^2} \cdot \frac{2^2}{3^2} = \frac{1}{3}$$

b) 
$$\frac{a^{-3} \cdot (ab^2)^3 \cdot (a^2)^4}{a^4 \cdot b^{-4} \cdot (ab)^3} = \frac{a^{-3}a^3b^6a^8}{a^4b^{-4}a^3b^3} = \frac{a^8b^6}{a^7b^{-1}} = ab^7$$

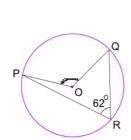
2. Calculate, giving the answer in standard form with 3 s.f.

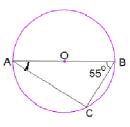
a) 
$$(1.86 \cdot 10^{-7}) \div (6.5 \cdot 10^{-12}) = (1.86 \div 6.5) \cdot 10^{-7+12} = 0.2862 \cdot 10^{5} = 2.86 \cdot 10^{4}$$

b) 
$$8.63 \cdot 10^{11} - 4.21 \cdot 10^{10} = 8.63 \cdot 10^{11} - 0.421 \cdot 10^{11} = 8.209 \cdot 10^{11} = 8.21 \cdot 10^{11}$$

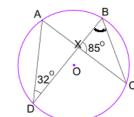
3. Find the measures of the unknown angles.

1- 
$$B\hat{A}C = 90 - 55 = 35^{\circ}$$





2-  $P\hat{O}Q = 2.62^{\circ} = 124^{\circ}$ 

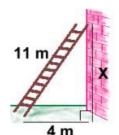


3- 
$$\hat{CBX} = 180 - 32 - 85 = 63^{\circ}$$

4. How far up a wall will an 11m ladder reach, if the foot of the ladder must be 4m from the base of the wall?

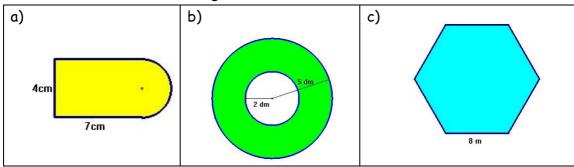
Pythagorean Theorem

$$11^2 = x^2 + 4^2 \rightarrow x^2 = 121 - 16 = 105 \rightarrow x = \sqrt{105} \text{ m}$$





5. Find the area of the shaded regions:



a) 
$$A = A_{\text{rectangle}} + \frac{1}{2}A_{\text{circle}} = 4 \cdot 7 + \frac{1}{2}\pi \cdot 2^2 = (28 + 2\pi)\text{cm}^2$$

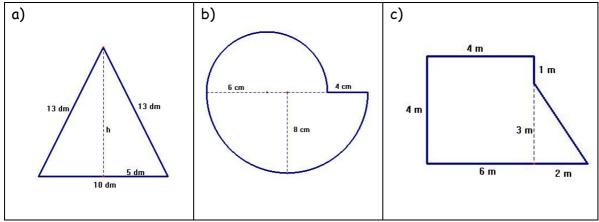
b) 
$$A = \pi \cdot R^2 - \pi \cdot r^2 = 25\pi - 4\pi = 21\pi \text{ dm}^2$$

c) 
$$A = \frac{P \cdot a}{2} \rightarrow First$$
, we calculate the apothem, using Pythagorean Theorem:

$$8^2 = 4^2 + a^2 \rightarrow a = \sqrt{64 - 16} = \sqrt{48} = 4\sqrt{3} \ m$$

$$A = \frac{P \cdot \alpha}{2} = \frac{48 \cdot 4\sqrt{3}}{2} = 96\sqrt{3} \text{ m}^2$$

6. Find the perimeter and area of the following shapes:



a) Pythagorean Theorem: 
$$13^2 = h^2 + 5^2 \rightarrow h^2 = 169 - 25 = 144 \Rightarrow h = 12 \text{ dm}$$

$$A = \frac{10 \cdot 12}{2} = 60 \text{ dm}^2$$
, Perimeter =  $10 + 13 + 13 = 36 \text{ dm}$ 

b) Two semicircles: one small with radius 6 cm and one big with radius 8 cm

$$A = \frac{\pi \cdot 8^2}{2} + \frac{\pi \cdot 6^2}{2} = 50\pi \text{ cm}^2$$
, Perimeter =  $\pi \cdot 8 + \pi \cdot 6 + 4 = (14\pi + 4) \text{ cm}$ 

c) A square and a triangle: Pythagorean theorem:

$$x^2 = 2^2 + 3^2 \rightarrow x^2 = 4 + 9 = 13 \Rightarrow h = \sqrt{13} \text{ m};$$

Perimeter = 
$$6 + 4 + 4 + 1 + \sqrt{13} = (15 + \sqrt{13}) \text{m}$$

Area = 
$$4^2 + \frac{2 \cdot 3}{2} == 19 \text{ m}^2$$