FACIT OCH KOMMENTARER

401 a) $11 - x = 22 \Leftrightarrow 11 - 22 = x \Leftrightarrow \boldsymbol{x = -11}$

b) $20x = 12 \Leftrightarrow x = 12/20 \Leftrightarrow \boldsymbol{x = 0{,}6}$

c) $x/8 = 4 + 4 \Leftrightarrow x = 8 \cdot 8 \Leftrightarrow \boldsymbol{x = 64}$

d) $3x = 4{,}1 - 3{,}5 \Leftrightarrow 3x = 0{,}6 \Leftrightarrow x = 0{,}6 / 3 \Leftrightarrow \boldsymbol{x = 0{,}2}$

402 a) $x/8 = 4 - 3 \Leftrightarrow x/8 = 1 \Leftrightarrow \boldsymbol{x = 8}$

b) $x/0{,}4 + 1{,}74 = -0{,}26 \Leftrightarrow x/0{,}4 = -0{,}26 - 1{,}74 \Leftrightarrow x = 0{,}4 \cdot -2$
$\Leftrightarrow \boldsymbol{x = -0{,}8}$

c) $x/9 = 18 \Leftrightarrow x = 9 \cdot 18 \Leftrightarrow \boldsymbol{x = 162}$

d) $10x/12 = 8 + 2 \Leftrightarrow 10x = 12 \cdot 10 \Leftrightarrow 10x = 120 \Leftrightarrow x = 120/10$
$\Leftrightarrow \boldsymbol{x = 12}$

403 a) $18 = -8x - 2x \Leftrightarrow 18 = -10x \Leftrightarrow x = -18/10 \Leftrightarrow \boldsymbol{x = -1{,}8}$

b) $x = 1\,250/1{,}25 \Leftrightarrow \boldsymbol{x = 1\,000}$

c) $6x + 3x = 0 \Leftrightarrow 9x = 0 \Leftrightarrow x = 0/9 \Leftrightarrow \boldsymbol{x = 0}$

d) $-3 - 8 = -4x + 6x \Leftrightarrow -11 = 2x \Leftrightarrow \boldsymbol{x = -5{,}5}$

404 a) $3x + 5x = 12 \Leftrightarrow 8x = 12 \Leftrightarrow x = 12/8 \Leftrightarrow \boldsymbol{x = 1{,}5}$

b) $14 = 3x - x \Leftrightarrow 14 = 2x \Leftrightarrow \boldsymbol{x = 7}$

c) $3 + 5 = 3x + 5x \Leftrightarrow 8 = 8x \Leftrightarrow \boldsymbol{x = 1}$

d) $14 + 10 = -4x + 2x \Leftrightarrow 24 = -2x \Leftrightarrow \boldsymbol{x = -12}$

405 a) $2x = -22 \Leftrightarrow \boldsymbol{x = -11}$

b) $6x = 20 - 80 \Leftrightarrow 6x = -60 \Leftrightarrow \boldsymbol{x = -10}$

c) $16 - 8 = 0{,}5x \Leftrightarrow 8 = 0{,}5x \Leftrightarrow x = 8/0{,}5 \Leftrightarrow \boldsymbol{x = 16}$

d) $100x = 1{,}25 + 0{,}55 \Leftrightarrow 100x = 1{,}8 \Leftrightarrow \boldsymbol{x = 0{,}018}$

406 a) $5x/7 = 15 - 5 \Leftrightarrow 5x/7 = 10 \Leftrightarrow 5x = 70 \Leftrightarrow \boldsymbol{x = 14}$

b) $2x/3 = 14 \Leftrightarrow 2x = 42 \Leftrightarrow \boldsymbol{x = 21}$

c) $0{,}75x - x = 1{,}25 \Leftrightarrow -0{,}25x = 1{,}25 \Leftrightarrow \boldsymbol{x = -5}$

d) $10 - 25 = -5x + 6x \Leftrightarrow \boldsymbol{x = -15}$

407 a) $5x + 3 + 2x = x + 21 \Leftrightarrow 7x - x = 21 - 3 \Leftrightarrow 6x = 18 \Leftrightarrow \boldsymbol{x = 3}$

b) $x^2 + 5x + 2x + 10 = x^2 + 3x \Leftrightarrow x^2 - x^2 + 7x - 3x = -10 \Leftrightarrow$
$4x = -10 \Leftrightarrow \boldsymbol{x = -2{,}5}$

c) $15x - 3x = 61 - 25 \Leftrightarrow 12x = 36 \Leftrightarrow \boldsymbol{x = 3}$

d) $7x - 5x = 16 + 6 \Leftrightarrow 2x = 22 \Leftrightarrow \boldsymbol{x = 11}$

408 a) $2x + 2 - 3x + 6 = 4x - 12 \Leftrightarrow -x + 8 = 4x - 12 \Leftrightarrow 8 + 12 = 4x + x$
$\Leftrightarrow 5x = 20 \Leftrightarrow \boldsymbol{x = 4}$

b) $x^2 + x - x - 1 - (x^2 - 2x - 2x + 4) = 2 \Leftrightarrow x^2 - 1 - x^2 + 4x - 4 = 2 \Leftrightarrow$
$4x - 5 = 2 \Leftrightarrow 4x = 7 \Leftrightarrow \boldsymbol{x = 1{,}75}$

c) $-2x = x^2 - 2x + 2x - 4 - (x^2 - 2x - 2x + 4) \Leftrightarrow -2x = -4 + 4x - 4$
$8 = 4x + 2x \Leftrightarrow 8 = 6x \Leftrightarrow x = 8/6 \Leftrightarrow \boldsymbol{x = 4/3}$

d) $8x + 9 - 6x + 8 = 13x - 4 - 5 + 2x \Leftrightarrow 2x + 17 = 15x - 9 \Leftrightarrow$
$26 = 13x \Leftrightarrow \boldsymbol{x = 2}$

409 a) $5x - 2x + 3 = 2 \Leftrightarrow 3x = 2 - 3 \Leftrightarrow 3x = -1 \Leftrightarrow \boldsymbol{x = -1/3}$

b) $9x + 45 - 12 - 8x = 7 - 2x + 2 \Leftrightarrow x + 33 = 9 - 2x \Leftrightarrow$
$x + 2x = 9 - 33 \Leftrightarrow 3x = -24 \Leftrightarrow \boldsymbol{x = -8}$

c) $9(x^2 + x + x + 1) - (6x + 9x^2 - 2 - 3x) = 41$
$9x^2 + 18x + 9 - 6x - 9x^2 + 2 + 3x = 41 \Leftrightarrow 15x + 11 = 41 \Leftrightarrow$
$15x = 41 - 11 \Leftrightarrow 15x = 30 \Leftrightarrow \boldsymbol{x = 2}$

d) $x^2 - x + 3x - 3 - (x^2 - 3x - 3x + 9) = 2x$
$x^2 + 2x - 3 - x^2 + 6x - 9 = 2x \Leftrightarrow 8x - 12 = 2x \Leftrightarrow 8x - 2x = 12 \Leftrightarrow$
$6x = 12 \Leftrightarrow \boldsymbol{x = 2}$

410 a) Obs: $(6x - 1)/4 = 6x/4 - 1/4 = 1{,}5x - 0{,}25$
$3x - 1{,}5x + 0{,}25 = 7 \Leftrightarrow 1{,}5x = 6{,}75 \Leftrightarrow x = 6{,}75/1{,}5 \Leftrightarrow \boldsymbol{x = 4{,}5}$

b) $2x^2 + 6x + 2x - x^2 - 3x = x^2 \Leftrightarrow 5x = 0 \Leftrightarrow \boldsymbol{x = 0}$

c) $x^2 + 5x + 2x + 10 = x^2 + 6x + 3x + 18 \Leftrightarrow 7x - 9x = 18 - 10 \Leftrightarrow$
$-2x = 8 \Leftrightarrow \boldsymbol{x = -4}$

d) $5x - 15 - 3x - 6 - x + 10 = 0 \Leftrightarrow x - 11 = 0 \Leftrightarrow \boldsymbol{x = 11}$

411 a) 20 % ökning gör att förändringsfaktorn blir **1,20**.

b) Ekvation: $\boldsymbol{1{,}20 \cdot x = 60}$

c) $1{,}20 \cdot x = 60$

$$x = \frac{60}{1{,}20} \qquad \left[= \frac{600}{12} = \frac{300}{6} = \frac{150}{3} \right]$$

$x = 50$

Svar: **50 kr**

412. Låt den okända sidan i rektangeln ha längden x. Ekvation:
$36 \cdot x = 144$

$$x = \frac{144}{36}$$

$$x = \frac{72}{18}$$

$$x = \frac{36}{9}$$

$$x = \frac{4 \cdot 9}{9}$$

$x = 4$

Svar: Den andra sidan har längden **4 meter**.

413. Låt cirkeln ha radie x meter. Ekvation ($\pi \approx 3$):

$$3 \cdot x^2 = 300$$
$$x^2 = \frac{300}{3}$$
$$x^2 = 100$$
$$x = \sqrt{100}$$
$$x \approx 10$$

Svar: Cirkelns radie ska vara ca **10 m**.

414. Låt cirkeln ha radie x meter. Arean för rektangeln är $10 \cdot 24{,}3 = 243$ m^2. Ekv:

$$\pi \cdot x^2 = 243$$
$$x^2 = \frac{243}{3}$$
$$x^2 = 81$$
$$x = \sqrt{81}$$
$$x = 9$$

Svar: Cirkelns radie ska vara **9 m**.

415. Kvadratens omkrets är $4 \cdot 12 = 48$ m. Låt cirkeln ha diameter x. Ekv:

$$\pi \cdot x = 48$$
$$x \approx \frac{48}{3}$$
$$x \approx 16$$

Svar: Radien är ca **8 m**.

416. Antag att bruttolönen är x kr. 33 % minskning ger en ändringsfaktor på: $1 - 0{,}33 = 0{,}67$. Ekvation:

$$0{,}67 \cdot x = 16500$$

$$x = \frac{16500}{0{,}67}$$

$$x \approx \frac{16500}{2/3}$$

0,67 är ungefär detsamma som 2/3

$$x \approx 16500 \cdot \frac{3}{2}$$

$$x \approx \frac{49500}{2}$$

$$x \approx 24750$$

Svar: Personen tjänar ungefär **24 750 kr/mån** brutto (mer exakt 24 627 kr).

417. Antag att vi har x m^3 under bark. Vi får då ekvationen

$$x \cdot 1{,}20 = 600$$

$$x = \frac{600}{1{,}20}$$

$$x = \frac{6000}{12}$$

$$x = \frac{6 \cdot 1000}{2 \cdot 6}$$

$$x = \frac{1000}{2}$$

$$x = 500$$

Svar: Cirka **500 m^3** under bark.

418. Antag att det hamnar x m^3 i A då borde det hamna tre gånger så mycket alltså $3 \cdot x$ m^3 i B. Ekvation:

$$x + 3x = 10000$$

$$4x = 10000$$

$$x = \frac{10000}{4}$$

$$x = 2500$$

Svar: Det hamnar ungefär **2 500 m^3 i del A och 7 500 m^3 i del B**.

419. Antag att vi ska tillsätta x kg vatten. Då blir totalvikten $2 + x$ kg. Saltvikten är: 10 % av 2 kg = $0{,}10 \cdot 2 = 0{,}2$ kg. Dividerar man saltvikten med den totala vikten ska det bli 5 % = 0,05. Ekvation:

$$\frac{0{,}2}{x+2} = 0{,}05$$
$$0{,}2 = 0{,}05 \cdot (x+2)$$
$$0{,}2 = 0{,}05x + 0{,}10$$
$$0{,}2 - 0{,}1 = 0{,}05x$$
$$0{,}1 = 0{,}05x$$
$$\frac{0{,}1}{0{,}05} = x$$
$$x = 2$$

Svar: **2 kg** vatten ska tillsättas.

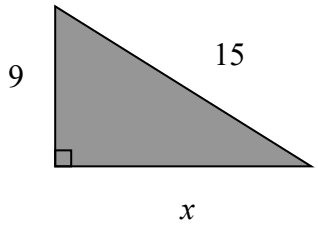
420 a) Pythagoras sats ger:
$15^2 + 10^2 = x^2$
$225 + 100 = x^2$
$x^2 = 325$
$x = \sqrt{325} \approx$ **18**

Här kan man prova sig fram $17^2 = 289$, $18^2 = 324$, $19^2 = 361$

b) Pythagoras sats ger:
$6^2 + x^2 = 10^2$
$36 + x^2 = 100$
$x^2 = 100 - 36$
$x^2 = 64$
$x = \sqrt{64} =$ **8**

421. Pythagoras sats ger: $3^2 + 4^2 = x^2 \Leftrightarrow x^2 = 25 \Leftrightarrow x = \sqrt{25} \Leftrightarrow x = 5$ m
Trädets ursprungliga höjd: $3 + 5 =$ **8 m**

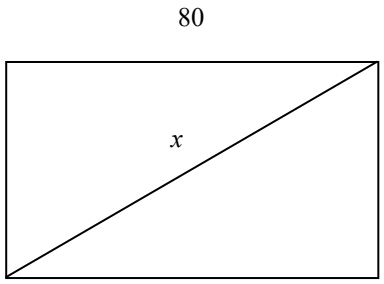
422. Antagande enligt figur.



$9^2 + x^2 = 15^2$
$81 + x^2 = 225$
$x^2 = 225 - 81$
$x = \sqrt{144}$
$x = 12$

Svar: Den tredje sidan i triangeln är **12 mm**.

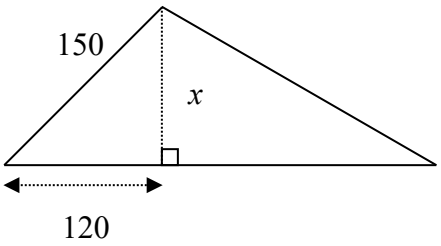
423. Antagande enligt figur.



$80^2 + 60^2 = x^2$
$6\,400 + 3\,600 = x^2$
$10\,000 = x^2$
$x = \sqrt{10000}$
$x \approx 100$

Svar: Diagonalen i rektangeln är ca **100 m**.

424. Antagande enligt figur.
Beräkna först x



Ur den vänstra triangeln fås:
$120^2 + x^2 = 150^2$
$14400 + x^2 = 22500$
$x^2 = 22500 - 14400$
$x = \sqrt{8100}$
$x = 90$

Arean = $(120 + 180) \cdot 90 / 2 = 300 \cdot 90 / 2 = 27\,000 / 2 = 13\,500\ \text{m}^2 \approx 1{,}4$ ha

Svar: Områdets area är ca **1,4 ha**.

425 a) $\dfrac{1}{9x} = \dfrac{2 \cdot 1}{2 \cdot 9x} = \dfrac{2}{18x}$

b) $\dfrac{7}{6x} = \dfrac{3 \cdot 7}{3 \cdot 6x} = \dfrac{21}{18x}$

c) $\dfrac{x}{9} = \dfrac{2x \cdot x}{2x \cdot 9} = \dfrac{2x^2}{18x}$

d) $x = \dfrac{x}{1} = \dfrac{18x \cdot x}{18x \cdot 1} = \dfrac{18x^2}{18x}$

e) $\dfrac{1}{3} = \dfrac{6x \cdot 1}{6x \cdot 3} = \dfrac{6x}{18x}$

f) $2x^2 = \dfrac{2x^2}{1} = \dfrac{18x \cdot 2x^2}{18x \cdot 1} = \dfrac{36x^3}{18x}$

426 a) $\dfrac{2y^2 - y}{y} = \dfrac{y(2y-1)}{y} = (2y-1)$

b) $\dfrac{2y - y^2}{y} = \dfrac{y(2-y)}{y} = (2-y)$

c) $\dfrac{2xy^2 - y}{y} = \dfrac{y(2xy-1)}{y} = (2xy-1)$

d) $\frac{2y^2+3y^3-y^4}{y}=\frac{y(2y+3y^2-y^3)}{y}=(2y+3y^2-y^3)$

427 a) $\frac{(y-2)^2-4}{y}=\frac{y^2-4y+4-4}{y}=\frac{y(y-4)}{y}=(y-4)$

b) $\frac{(y-3)(y+3)+9}{y^3}=\frac{y^2+3y-3y-9+9}{y^3}=\frac{y^2}{y^3}=\frac{1}{y}=y^{-1}$

c) $\frac{(y+3)(2y-4)-2y^2}{y-6}=\frac{2y^2-4y+6y-12-2y^2}{y-6}=\frac{2y-12}{y-6}=$

$\frac{2(y-6)}{(y-6)}=2$

d) $\frac{(1-y)(2y-4)+2y(y-1)}{4}=\frac{2y-4-2y^2+4y+2y^2-2y}{4}=$

$\frac{4y-4}{4}=\frac{4(y-1)}{4}=(y-1)$

428 a) $\frac{\left(\frac{2}{3}+\frac{1}{2}\right)}{\left(\frac{1}{3}-\frac{1}{6}\right)}=\frac{\frac{6\cdot2}{3}+\frac{6\cdot1}{2}}{\frac{6\cdot1}{3}-\frac{6\cdot1}{6}}=\frac{4+3}{2-1}=\frac{7}{1}=7$

b) $\frac{\left(\frac{3}{y}+3\right)}{\left(1+\frac{1}{y}\right)}=\frac{\frac{y\cdot3}{y}+y\cdot3}{y\cdot1+\frac{y\cdot1}{y}}=\frac{3+3y}{y+1}=\frac{3(1+y)}{(1+y)}=3$

429 a) $y = 2x + 3$

$y - 3 = 2x$

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

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

$x = 0{,}5y - 1{,}5$

b) $2y - 3x = -5$

$2y + 5 = 3x$

$\frac{2}{3}y + \frac{5}{3} = x$

$x = \frac{2}{3}y + \frac{5}{3}$

c) $y = \frac{5}{6}x - 1$

$6 \cdot y = \frac{6 \cdot 5}{6}x - 6 \cdot 1$

$6y = 5x - 6$

$6y + 6 = 5x$

$\frac{6y}{5} + \frac{6}{5} = x$

$x = 1{,}2y + 1{,}2$

d) $3y = 2x + 3$

$3y - 3 = 2x$

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

$x = 1{,}5y - 1{,}5$

430 a) $4y - 3z + 13 = 0$

$4y + 13 = 3z$

$\frac{4}{3}y + \frac{13}{3} = z$

$z = \frac{4}{3}y + 4\frac{1}{3}$

b) $-3x + 4z - 9 = 0$

$4z = 3x + 9$

$z = \frac{3}{4}x + \frac{9}{4}$

$z = 0{,}75x + 2{,}25$

c) $0 = x - 7z - 3$

$7z = x - 3$

$z = \frac{x - 3}{7}$

$z = \frac{1}{7}x - \frac{3}{7}$

d) $5z - y = y + 7z - 3$

$-y - y + 3 = 7z - 5z$

$-2y + 3 = 2z$

$\frac{-2}{2}y + \frac{3}{2} = z$

$z = -y + 1{,}5$

$z = 1{,}5 - y$

431 a)

$$\frac{1}{r} = x$$
$$1 = x \cdot r$$
$$\frac{1}{x} = r$$
$$r = \frac{1}{x}$$

b)

$$\frac{r}{x} + z = 2$$
$$\frac{x \cdot r}{x} + x \cdot z = x \cdot 2$$
$$r + xz = 2x$$
$$r = 2x - xz$$
$$r = x(2 - z)$$

c)

$$4 = \frac{x}{r} - z$$
$$4r = \frac{r \cdot x}{r} - zr$$
$$4r + zr = x$$
$$r(4 + z) = x$$
$$r = \frac{x}{(4 + z)}$$

d)

$$5 = \frac{1}{r} - 3$$
$$8 = \frac{1}{r}$$
$$r \cdot 8 = 1$$
$$r = \frac{1}{8}$$

432 a)

$$a(a - b) = (a + 2)(a - 1)$$
$$a^2 - ab = a^2 - a + 2a - 2$$
$$-ab = a - 2$$
$$2 = a + ab$$
$$2 = a(1 + b)$$
$$\frac{2}{1 + b} = a$$
$$a = \frac{2}{1 + b}$$

b)

$$0 = 7(ax - 3)$$
$$0 = ax - 3$$
$$3 = ax$$
$$\frac{3}{x} = a$$
$$a = \frac{3}{x}$$

c)

$$\frac{1}{a} + \frac{2}{a} = \frac{x}{3} + 2$$
$$\frac{3a \cdot 1}{a} + \frac{3a \cdot 2}{a} = \frac{3ax}{3} + 3a \cdot 2$$
$$3 + 6 = ax + 6a$$
$$9 = a(x + 6)$$
$$\frac{9}{(x + 6)} = a$$

d)

$$\frac{1}{a} - 5x = 4$$
$$\frac{a \cdot 1}{a} - a \cdot 5x = a \cdot 4$$
$$1 - 5ax = 4a$$
$$1 = 4a + 5ax$$
$$1 = a(4 + 5x)$$
$$a = \frac{1}{(4 + 5x)}$$

433 a) $s = v \cdot t$

$$\frac{s}{v} = t$$

$$t = \frac{s}{v}$$

b) $d = \frac{m}{V}$

$$V \cdot d = m$$

$$V = \frac{m}{d}$$

c) $v = v_0 + at$

$$v - v_0 = at$$

$$\frac{v - v_0}{t} = a$$

$$a = f^2 kR$$

$$\frac{a}{kR} = f^2$$

$$f = \sqrt{\frac{a}{kR}}$$

434 a) $t = s / v$

b) $V = m / d$

c) $a = (v - v_0) / t$

d) $f = \sqrt{}(a / (kR))$