

一、选择题

1~5.CABCC

6~10.BCCDB

二、填空题

11. $\frac{5}{13}$

12.6

13.60°

14. $15\sqrt{3}+15$

15.26

16.14.4

17.没有超速

18.15°或 45°或 75°

三、解答题

19.解:在 Rt△BDC 中,

$$\therefore \sin \angle BDC = \frac{BC}{BD},$$

$$\therefore BC = BD \cdot \sin \angle BDC = 10\sqrt{2} \times \sin 45^\circ = 10\sqrt{2} \times \frac{\sqrt{2}}{2} = 10.$$

在 Rt△ABC 中, $\therefore \sin A = \frac{BC}{AB} = \frac{10}{20} =$

$$\frac{1}{2},$$

 $\therefore \angle A = 30^\circ.$

20.解:过点 P 作 y 轴的垂线,垂足为 M.

$$\text{则 } \sin \alpha = \frac{PM}{OP} = \frac{6}{\sqrt{6^2+8^2}} = \frac{3}{5}.$$

21.解:(1)过点 A 作 AE⊥BC 于点 E.

$$\therefore \cos C = \frac{\sqrt{2}}{2}, \therefore \angle C = 45^\circ.$$

在 Rt△ACE 中, $CE = AC \cos C = 1.$ $\therefore AE = CE = 1.$ 在 Rt△ABE 中, $\tan B = \frac{1}{3},$

$$\text{即 } \frac{AE}{BE} = \frac{1}{3},$$

 $\therefore BE = 3AE = 3,$ $BC = BE + CE = 4.$ (2) $\therefore AD$ 是 △ABC 的中线,

$$\therefore CD = \frac{1}{2}BC = 2.$$

 $\therefore DE = CD - CE = 1.$ $\therefore AE \perp BC, DE = AE,$ $\therefore \angle ADC = 45^\circ.$

$$\therefore \sin \angle ADC = \frac{\sqrt{2}}{2}.$$

22.解:作 CE⊥AB 于点 E,

(1)在 Rt△ABD 中, $AD = \frac{AB}{\tan \alpha} =$

$$\frac{30}{\sqrt{3}} = 10\sqrt{3} \text{ (米)}.$$

(2)在 Rt△BCE 中,

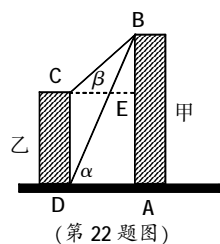
 $CE = AD = 10\sqrt{3}$ (米),

$$BE = CE \cdot \tan \beta = 10\sqrt{3} \times \frac{\sqrt{3}}{3} =$$

10 (米).

则 $CD = AE = AB - BE = 30 - 10 = 20$ (米).

答:乙建筑物的高度 CD 为 20 米.

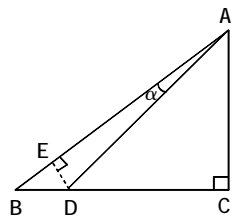


(第 22 题图)

23.解:(1) $\therefore \tan B = \frac{3}{4},$ \therefore 设 $AC = 3x$, 则 $BC = 4x.$ 由勾股定理,得 $(3x)^2 + (4x)^2 = 5^2.$ 解得 $x = 1$ (舍去 $x = -1$). $\therefore AC = 3, BC = 4.$ $\therefore BD = 1, \therefore CD = 3.$

$$\therefore AD = \sqrt{CD^2 + AC^2} = 3\sqrt{2}.$$

(2)如图,过点 D 作 DE⊥AB 于点 E, 则 △BDE ∽ △BAC.



(第 23 题图)

$$\therefore \frac{DE}{AC} = \frac{BD}{AB}, \text{ 即 } \frac{DE}{3} = \frac{1}{5}.$$

$$\therefore DE = \frac{3}{5}.$$

$$\therefore \sin \alpha = \frac{DE}{AD} = \frac{\sqrt{2}}{10}.$$

24.解:需要拆除.

理由: $\therefore CB \perp AB, \angle CAB = 45^\circ,$ $\therefore \triangle ABC$ 为等腰直角三角形. $\therefore AB = BC = 10$ (米).在 Rt△BCD 中,新坡面 DC 的坡度为 $i = \sqrt{3}:3$, 即 $\angle CDB = 30^\circ,$

$$\therefore DC = 2BC = 20 \text{ (米)}, BD = \sqrt{CD^2 - BC^2} = 10\sqrt{3} \text{ (米)}.$$

$$\therefore AD = BD - AB = 10\sqrt{3} - 10 \approx 7.32 \text{ (米)}.$$

 $\therefore 3 + 7.32 = 10.32 > 10,$ \therefore 需要拆除.25.解:在 Rt△ACP 中, $\angle ACP = 90^\circ,$
 $\angle A = 65^\circ, AP = 80.$

$$\therefore \sin A = \frac{PC}{AP},$$

$$\therefore PC = AP \cdot \sin A = 80 \times \sin 65^\circ \approx 80 \times 0.91 = 72.8.$$

在 Rt△BCP 中, $\angle BCP = 90^\circ, \angle B = 34^\circ, PC = 72.8.$

$$\therefore \sin B = \frac{PC}{PB},$$

$$\therefore PB = \frac{PC}{\sin B} = \frac{72.8}{\sin 34^\circ} \approx \frac{72.8}{0.56} = 130$$

(海里).

答:这时,海轮所在的 B 处距离灯塔 P 约有 130 海里.

26.解:如图,作 MF⊥PQ 于点 F, QE⊥MN 于点 E, 则四边形 EMFQ 是矩形.

在 Rt△QEN 中, 设 $EN = x$, 则 $EQ = 2x.$

$$\therefore QN^2 = EN^2 + QE^2,$$

$$\therefore 20 = 5x^2.$$

$$\therefore x > 0,$$

$$\therefore x = 2.$$

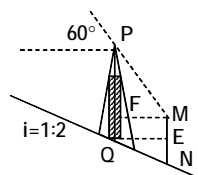
$$\therefore EN = 2, EQ = MF = 4.$$

$$\therefore MN = 3,$$

$$\therefore FQ = EM = 1.$$

$$\text{在 Rt } \triangle PFM \text{ 中, } PF = FM \cdot \tan 60^\circ = 4\sqrt{3},$$

$$\therefore PQ = PF + FQ = 4\sqrt{3} + 1.$$

答:信号塔 PQ 的高为 $(4\sqrt{3} + 1)$ 米.

(第 26 题图)

一、选择题

1~5.ADDDC

6~10.ABBCD

二、填空题

11.1.5

12.12, 20

13.3

14.87°

15.100

16.(2, 1)

17. $\frac{1}{4}$

18.(3, 1) 或 (1, -1)

三、解答题

19.解:在 △ACD 与 △BCA 中,

 $\therefore \angle CAD = \angle B, \angle ACD = \angle BCA,$ $\therefore \triangle ACD \sim \triangle BCA.$

$$\therefore \frac{AC}{BC} = \frac{CD}{CA}.$$

$$\therefore AC^2 = CD \cdot BC = CD \cdot (CD + BD) = 4 \times (4 + 2) = 24.$$

$$\therefore AC = \sqrt{24} = 2\sqrt{6}.$$

20.解:(1) $BD = 6, DE = 3.$ (2) $\therefore \triangle ADE \sim \triangle ABC,$

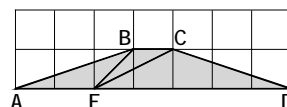
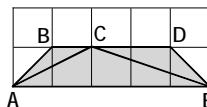
$$\therefore S_{\triangle ADE} : S_{\triangle ABC} = (DE : BC)^2 = 1 : 9,$$

即 $2 : S_{\triangle ABC} = 1 : 9.$

$$\therefore S_{\triangle ABC} = 18.$$

$$\therefore S_{\text{四边形 } BCED} = S_{\triangle ABC} - S_{\triangle ADE} = 18 - 2 = 16.$$

21.解:如图所示.



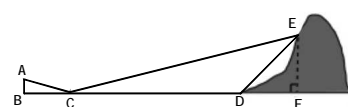
(第 21 题图)

22.解:(1)正东方向, 3cm, 300m.

(2)图书馆.

(3)花坛(4, 5), 图书馆(6, 7), 游泳馆(10, 9), 电影院(11, 7), 教学楼(8, 4), 早冰场(10, 1).

23.解:如图,过点 E 作 EF⊥BC 于点 F.



(第 23 题图)

 $\therefore \angle CDE = 135^\circ,$ $\therefore \angle EDF = 45^\circ.$ 设 $EF = x$ 米, 则 $DF = x$ 米, $DE = \sqrt{2}x$ 米. $\therefore \angle B = \angle EFC = 90^\circ, \angle ACB = \angle ECD,$ $\therefore \triangle ABC \sim \triangle EFC.$

$$\therefore \frac{AB}{EF} = \frac{BC}{FC}, \text{ 即 } \frac{1.5}{x} = \frac{6}{24+x}.$$

解得 $x = 8.$ 经检验, $x = 8$ 是原分式方程的解.

$$\therefore DE = 8\sqrt{2}.$$

答:DE 的长度为 $8\sqrt{2}$ 米.24.解:(1)证明: $\therefore DB$ 平分 $\angle ADC,$ $\therefore \angle ADB = \angle CDB.$ 又 $\therefore \angle ABD = \angle BCD = 90^\circ,$ $\therefore \triangle ABD \sim \triangle BCD.$

$$\therefore \frac{AD}{BD} = \frac{BD}{CD}.$$

$$\therefore BD^2 = AD \cdot CD.$$

(2) $\therefore BM \parallel CD,$ $\therefore \angle MBD = \angle BDC.$ 又 $\angle ADB = \angle CDB,$ $\therefore \angle ADB = \angle MBD$, 且 $\angle ABD = 90^\circ.$ $\therefore BM = MD, \angle MAB = \angle MBA.$ $\therefore BM = MD = AM = 4.$ $\therefore BD^2 = AD \cdot CD$, 且 $CD = 6, AD = 8,$

$$\therefore BD^2 = 48.$$

$$\therefore BC^2 = BD^2 - CD^2 = 12.$$

$$\therefore MC^2 = MB^2 + BC^2 = 28.$$

$$\therefore MC = 2\sqrt{7}.$$

 $\therefore BM \parallel CD,$ $\therefore \triangle MNB \sim \triangle CND.$

$$\therefore \frac{BM}{CD} = \frac{MN}{CN} = \frac{2}{3}.$$

$$\therefore MN = \frac{2}{5}MC = \frac{4}{5}\sqrt{7}.$$

25.解:连结 MN.

 $\therefore AM = 1$ 千米, $AN = 1.8$ 千米, $AB = 54$ 米, $AC = 30$ 米,

$$\therefore \frac{AM}{AC} = \frac{AN}{AB}.$$

又 $\therefore \angle A = \angle A,$ $\therefore \triangle ABC \sim \triangle ANM.$

$$\therefore \frac{MN}{BC} = \frac{AN}{AB} = \frac{1800}{54}.$$

$$\therefore MN = 45 \times \frac{1800}{54} = 1500 \text{ (米)}.$$

答:M、N 两点之间的直线距离为 1500 米.

26.解:(1) $\therefore BD \parallel AC,$ $\therefore \angle BDO = \angle OAC = 75^\circ.$ $\therefore \angle AOC = \angle DOB,$ $\therefore \triangle DOB \sim \triangle AOC.$

$$\therefore \frac{DO}{AO} = \frac{BO}{CO} = \frac{1}{3}.$$

$$\therefore AO = 3\sqrt{3},$$

$$\therefore DO = \sqrt{3}.$$

$$\therefore AD = AO + DO = 3\sqrt{3} + \sqrt{3} = 4\sqrt{3}.$$

 \therefore 在 △ABD 中, $\angle BAO = 30^\circ,$
 $\angle ADB = 75^\circ,$

$$\therefore \angle ABD = 180^\circ - \angle BAD - \angle ADB = 180^\circ - 30^\circ - 75^\circ = 75^\circ.$$

 $\therefore \angle ABD = \angle ADB.$

$$\therefore AB = AD = 4\sqrt{3}.$$

(2)过点 B 作 BE//AD 交 AC 于点 E.

 $\therefore AC \perp AD,$ $\therefore \angle DAC = \angle BEA = 90^\circ.$ $\therefore \angle AOD = \angle EOB,$ $\therefore \triangle AOD \sim \triangle EOB.$

$$\therefore \frac{BO}{DO} = \frac{EO}{AO} = \frac{BE}{DA}.$$

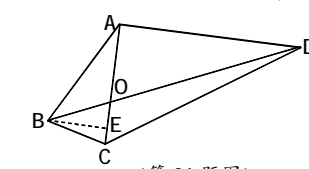
 $\therefore BO : OD = 1 : 3,$

$$\therefore \frac{EO}{AO} = \frac{BE}{DA} = \frac{1}{3}.$$

$$\therefore AO = 3\sqrt{3},$$

$$\therefore EO = \sqrt{3}.$$

$$\therefore AE = 4\sqrt{3}.$$

 $\therefore \angle ABC = \angle ACB = 75^\circ,$ $\therefore \angle BAC = 30^\circ, AB = AC.$ $\therefore AB = 2BE.$ 在 Rt△AEB 中, $BE^2 + AE^2 = AB^2,$ 即 $(4\sqrt{3})^2 + BE^2 = (2BE)^2$, 得 $BE = 4.$ $\therefore AB = AC = 8, AD = 12.$ 在 Rt△CAD 中, $AC^2 + AD^2 = CD^2,$ 即 $8^2 + 12^2 = CD^2$, 得 $CD = 4\sqrt{13}.$ 

(第 26 题图)

1.C

2.5

24.2 直角三角形的性质

1.5

2.C

24.3.1 锐角三角函数

第1课时

1.A

2. $\frac{4}{5}$

3.A

4.解: $\because \angle C=90^\circ, a=8, c=17,$

$\therefore b=\sqrt{c^2-a^2}=\sqrt{17^2-8^2}=15.$

$\sin A=\frac{a}{c}=\frac{8}{17}, \cos A=\frac{b}{c}=\frac{15}{17},$

$\tan A=\frac{a}{b}=\frac{8}{15}.$

5.B

第2课时

1.C

2.C

3.90°

4.解:(1)原式= $\sqrt{3} \times \frac{\sqrt{3}}{2} + \sqrt{2} \times$

$\frac{\sqrt{2}}{2} = \frac{3}{2} + 1 = \frac{5}{2}.$

(2)原式= $6 \times \left(\frac{\sqrt{3}}{3}\right)^2 - \sqrt{3} \times \frac{\sqrt{3}}{2} =$

$2 \times \frac{\sqrt{2}}{2} = 6 \times \frac{1}{3} - \frac{3}{2} - \sqrt{2} = \frac{1}{2} - \sqrt{2} =$

$\frac{1-2\sqrt{2}}{2}.$

5.60°

24.3.2 用计算器求锐角三角函数值

1.A

2.解:(1) $\sin 47^\circ \approx 0.7314,$

(2) $\cos 25^\circ 18' \approx 0.9041,$

(3) $\tan 44^\circ 59' 59'' \approx 1.0000.$

3.(1) $72^\circ 24';$

(2) $30^\circ 36';$

(3) $10^\circ 42'.$

3版

基础巩固

一、选择题

1~4.CAAC

5~8.CADB

二、填空题

9.60°, $\frac{\sqrt{3}}{2}$

10.30°

11. $\beta < \gamma < \alpha$

12.35

13. $\frac{2\sqrt{5}}{5}$

14.8.8

15. $\frac{\sqrt{5}-1}{2}$

三、解答题

16.解:(1) $\sin 45^\circ \cos 45^\circ + \tan 60^\circ \sin 60^\circ =$

$\frac{\sqrt{2}}{2} \times \frac{\sqrt{2}}{2} + \sqrt{3} \times \frac{\sqrt{3}}{2} = \frac{1}{2} + \frac{3}{2} = 2.$

(2) $\sin 30^\circ - \cos^2 45^\circ + \frac{3}{4} \tan^2 30^\circ +$

$\sin^2 60^\circ - \cos 60^\circ$

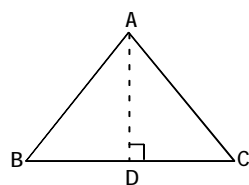
$= \frac{1}{2} - \left(\frac{\sqrt{2}}{2}\right)^2 + \frac{3}{4} \times \left(\frac{\sqrt{3}}{3}\right)^2 +$

$\left(\frac{\sqrt{3}}{2}\right)^2 - \frac{1}{2}$

$= \frac{1}{2} - \frac{1}{2} + \frac{1}{4} + \frac{3}{4} - \frac{1}{2}$

$= \frac{1}{2}.$

17.解:如图,作 $AD \perp BC$,垂足为 D.



(第17题图)

$\therefore AB=AC=5, AD \perp BC, BC=6,$

$\therefore BD=CD=3.$

$\therefore AD=4.$

$\therefore \sin B = \frac{AD}{AB} = \frac{4}{5}, \cos B = \frac{BD}{AB} = \frac{3}{5},$

$\tan B = \frac{AD}{BD} = \frac{4}{3}.$

18.解:如图,作 $BE \perp AD$ 于点 E.

$\therefore \angle CAB=30^\circ, AB=4\text{km},$

$\therefore \angle ABE=60^\circ, BE=2\text{km}.$

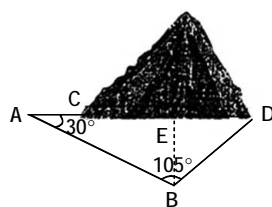
$\therefore \angle ABD=105^\circ,$

$\therefore \angle EBD=45^\circ \therefore \angle EDB=45^\circ.$

$\therefore DE=BE=2\text{km}.$

$\therefore BD=\sqrt{2^2+2^2}=2\sqrt{2}(\text{km}).$

答:BD的长是 $2\sqrt{2}\text{ km}.$



(第18题图)

能力提升

19.B

20.解:(1) $\because DE \parallel BC, DE=3, BC=9,$

$\therefore \triangle AED \sim \triangle ACB.$

$\therefore \frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{3}.$

(2) $\because \frac{AD}{AB} = \frac{1}{3}, BD=10,$

$\therefore \frac{AD}{AD+10} = \frac{1}{3}.$

$\therefore AD=5.$

$\therefore AB=15.$

在 $\text{Rt} \triangle ABC$ 中, $\sin A = \frac{BC}{AB} = \frac{9}{15} =$

$\frac{3}{5}.$

延伸拓展

21. 解:在 $\text{Rt} \triangle ACD$ 中, $\sin \alpha = \frac{AD}{AC} =$

$\frac{8}{6\sqrt{2}} = \frac{2}{3}\sqrt{2}.$

在 $\text{Rt} \triangle ACD$ 中,由勾股定理,得 $CD=$

$\sqrt{AC^2-AD^2} = \sqrt{(6\sqrt{2})^2-8^2} = 2\sqrt{2}.$

根据题意,得 $\angle B = \angle \alpha,$

$\therefore \cos B = \cos \alpha = \frac{CD}{AC} = \frac{2\sqrt{2}}{6\sqrt{2}} = \frac{1}{3}.$

第11期

2版

24.4 解直角三角形

第1课时

1.C

2.B

3.2, 60°

4.10

5. 解:(1)在 $\text{Rt} \triangle ABC$ 中, $\angle C=$

$90^\circ, \angle A=30^\circ, c=6,$

$\therefore \sin A = \sin 30^\circ = \frac{a}{c} = \frac{1}{2}.$

$\therefore a=3.$

$\therefore b=\sqrt{c^2-a^2}=3\sqrt{3}.$

又 $\because \angle A + \angle B = 90^\circ,$

$\therefore \angle B=60^\circ.$

(2) $\because a=24, c=24\sqrt{2},$

根据勾股定理,得 $b^2=c^2-a^2,$

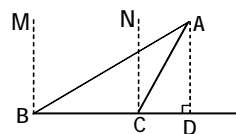
$\therefore b=24.$

$\therefore a=b,$

$\therefore \angle A = \angle B = 45^\circ.$

6.A

7.解:如图,过点 A 作 $AD \perp BC$ 于点 D.



(第7题图)

由题意,知 $\angle MBA=60^\circ, \angle NCA=30^\circ.$

$\therefore \angle ABC=30^\circ, \angle ACD=60^\circ.$

$\therefore \angle CAB=30^\circ.$

$\therefore \angle ABC = \angle CAB.$

\therefore 在 $\triangle ABC$ 中, $AC=BC=10.$

在 $\text{Rt} \triangle CAD$ 中,

$AD=AC \cdot \sin \angle ACD = 10 \times \frac{\sqrt{3}}{2} =$

$5\sqrt{3}.$

$\therefore 5\sqrt{3} > 8,$

\therefore 渔船不改变航线继续向东航行,没有触礁的危险.

第2课时

1.D 2.262

3.解:设大厦 AB 的高度为 x 米.

由题意,得 $\angle ADB=45^\circ, \angle ACB=30^\circ.$

$\therefore BD=x$ 米, $BC=\sqrt{3}AB=\sqrt{3}x$

(米).

$\therefore CD=80$ 米,

$\therefore BC-BD=\sqrt{3}x-x=80.$

解得 $x=\frac{80}{\sqrt{3}-1} \approx 109.3$ (米).

答:大厦的高度约为 109.3 米.

第3课时

1.26

2.解: $\because \angle AEB=90^\circ, AB=200,$ 斜坡

AB 的坡度为 $1:\sqrt{3},$

$\therefore \tan \angle ABE = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}.$

$\therefore \angle ABE=30^\circ.$

$\therefore AE=\frac{1}{2}AB=100.$

$\therefore AC=20,$

$\therefore CE=80.$

$\therefore \angle CED=90^\circ,$ 斜坡 CD 的坡度为 1:4,

$\therefore \frac{CE}{DE} = \frac{1}{4},$

即 $\frac{80}{ED} = \frac{1}{4}.$

解得 $ED=320.$

$\therefore CD=\sqrt{80^2+320^2}=80\sqrt{17}$ (米).

答:斜坡 CD 的长是 $80\sqrt{17}$ 米.

3版

一、选择题

1~4.BAAA

5~8.ABAB

二、填空题

9.4

10.6

11.30°

12. $\frac{64\sqrt{3}}{3}$

13. $20\sqrt{3}-20$

14.1.02

15.75 或 25

三、解答题

16.(1) $AC=8\sqrt{3}.$

(2) $\angle B=45^\circ.$

17.解:由题意,得 $AE \parallel CD,$

$\therefore \angle EAC = \angle ACD = 30^\circ, \angle EAB =$

$\angle ABD=60^\circ.$

设 $AD=x,$

在 $\text{Rt} \triangle ACD$ 中, $\tan 30^\circ = \frac{AD}{CD}, CD=$

$\sqrt{3}x.$

在 $\text{Rt} \triangle ABD$ 中, $\tan 60^\circ = \frac{AD}{BD}, BD=$

$\frac{\sqrt{3}}{3}x.$

$\therefore CD-BD=BC, BC=30$ 米,

$\therefore \sqrt{3}x - \frac{\sqrt{3}}{3}x = 30, x = 15\sqrt{3} \approx$

25.98(米).

答:无人机飞行高度 AD 约为 25.98 米.

18.解:过点 A 作 $AD \perp BC$ 于点 D, 则 AD 的长为点 A 到河岸 BC 的距离, 设 $AD=x\text{m}.$

由题意知 $\angle BAD=30^\circ, \angle CAD=45^\circ.$

\therefore 在 $\text{Rt} \triangle ADC$ 中, $CD=AD=x,$

在 $\text{Rt} \triangle ABD$ 中,

$BD=AD \tan 30^\circ = \frac{\sqrt{3}}{3}x.$

$\therefore BD+CD=150,$

$\therefore x + \frac{\sqrt{3}}{3}x = 150.$

解得 $x \approx 95.$

答:点 A 到河岸 BC 的距离是 95 m.